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Relationship Between Self-Reported Use of Oral Contraceptives  
and Perceptual-Motor Performance\*

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Abstract

Performance of 9 users and 6 non-users of oral contraceptives on a perceptual-motor task (Atari Jet Pursuit video game) was examined. Although all Ss improved with practice, non-users exhibited continued significantly superior performance over 40 practice trials and 36 test trials spanning 12 days.

Key words: oral contraceptives, perceptual-motor performance

Based on research suggesting relationships between cognitive performance and the menstrual cycle (e.g., Broverman et al. 1981; Kirstein et al. 1980-81; Sommer 1983), and between thermoregulation and the menstrual cycle (Stephensen and Kolka 1988), we hypothesized that the cycle might be a significant moderator variable in a study (Fine 1987) of the effects of heat and chemical protective clothing on the ability of female soldiers to sustain performance of a number of cognitive tasks.

Unfortunately, the distribution of menstrual cycles obtained was too skewed to be useful and the hypothesis could not be tested.

However, information was available on the participants' use of oral contraceptives (The Pill), and a retrospective analysis was done on the relationship between The Pill and performance of the cognitive tasks and of a perceptual-motor task also included in the study (Fine 1987).

We report here the discovery of a significant, seemingly important,

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relationship between The Pill and perceptual-motor performance. It is supported by, lends support to and extends the work of Hudgens et al. (1988), who, at approximately the same time and unbeknownst to us, were investigating very similar relationships.

### Method

#### Subjects

Subjects (Ss) were 17 female soldier volunteers (ages 20-34; median = 22), screened by a physician to insure that they were in good health. Two Ss declined to furnish pill usage information. Nine of the remaining women were using The Pill ("Users") and six were not ("Non-users"). Ss volunteered information on Pill usage with assurances that their names would never appear in association with their responses. The research conformed to U.S. Army Medical Research and Development Command Regulation 70-25 on Use of Volunteers in Research.

#### Measures

Perceptual-motor task: The task was the "Jet Fighter" video game (Atari Video Arcade, Model No. CZ-2600 with Sears cartridge #99801) .

Ss competed against the game's computer, rather than against one another. The task involved "piloting" an airplane, visible on a video screen, by manipulating a "joy stick" and attempting to "shoot down" a second airplane which flew in seemingly random patterns. "Shooting" involved pressing a button on the joy stick control unit. This launched a visible projectile in the direction in which the S's aircraft was headed. A "hit" occurred when the S's airplane was accurately aligned with the enemy plane, from any angle, and the S simultaneously pressed the "shoot" button. After a hit, the target plane spun several times and flew in a new direction. The number of hits was displayed cumulatively

on the screen. A "trial" lasted 2 1/2 minutes during which time the S had to pursue the enemy aircraft and shoot it down as many times as possible. The score for each trial was the number of hits. The joy stick was manipulated with the right hand and the firing button with the left.

#### Procedure

The design of the larger study (Fine 1987) involved training the Ss on various tasks for two successive weeks (excluding week-ends) and then testing them on each of four seven-hour "experimental" days during the third week. Experimental testing was done under normal and hot conditions with and without chemical protective clothing.

Ss practiced the Jet Fighter task on each of the first four days of the second week of training, ten trials per session, one session per day, always at the same time; a total of 40 practice trials (determined by pre-test as sufficient for attaining asymptotic performance). They then performed the task in the third week, three trials per session, with a session occurring in each of the 2nd, 4th and 6th hours of each of the four seven-hour experimental days; a total of 36 test trials.

Ss practiced and were tested individually in a darkened room. Each S was seated at a small table, approximately five feet from a 24" video screen. The joy stick control was located on the table wherever comfortable for the S. There were no rest periods between trials. A technician recorded the scores and re-started the game after each trial.

#### Results

Using number of hits as the dependent variable, separate two-way (Pill usage x sessions) analyses of variance (ANOVAs) were calculated for practice and experimental conditions, since each was based on a different number of trials per session. ANOVA for practice conditions

yielded very significant effects for sessions ( $F=13.1, df3, 52, p<.0001$ ) and for pill-usage ( $F=27.9, df1, 52, p<.0001$ ). ANOVA for experimental conditions resulted in a highly significant effect for pill-usage only ( $F=74.8, df1, 144, p<.0001$ ).

The results are summarized in Figure 1. In terms of learning the task, both User and Non-user groups significantly improved over the four practice sessions, but not during the experimental sessions, verifying the initial assessment of amount of practice required.

Two-tailed t-tests were calculated between User and Non-user group mean number of hits for each session. The group using The Pill always averaged significantly fewer hits per session. The p-values associated with the t-tests are shown in Figure 1. On the average, Pill use accounted for about 28% of the variance in performance ( $W^2$ ; Hays 1963). (N is reduced in hours 4 and 6 of the 12th day -sessions 15 and 16- because some Ss had to be withdrawn from the heat stress of that day.)

None of the participants had performed this or similar tasks before.

No relationships were found between Pill use and any of the cognitive variables, regardless of whether or not participants wore chemical protective clothing and/or were exposed to heat.

#### Discussion

If this study had to stand alone, the possibility that members of the User and Non-user groups, by chance, differed in perceptual-motor ability would have to be considered. However, the strong similarity between our results and those of Hudgens et al. (1988), makes this possibility highly unlikely. An experiment in which differences in ability and in Pill usage were controlled appears to be ethically impossible.

At this early stage, it is difficult to tell whether the adverse effects on performance are due directly to the contents of The Pill or to later physical changes induced by The Pill. According to the data of Hudgens et al. (1988), Users performed a steadiness task at the same reduced level as Non-users who were in the pre-menstrual phase of their cycles; it is as if, performance-wise, The Pill "locks" women into the pre-menstrual phase. What this means in terms of specific hormonal or other influences on perception and/or neuromuscular control and why cognition does not appear to be affected are questions worthy of further study. The negative implications of Pill usage for performance of complex every-day activities such as motor vehicle operation are obvious and also merit serious consideration.

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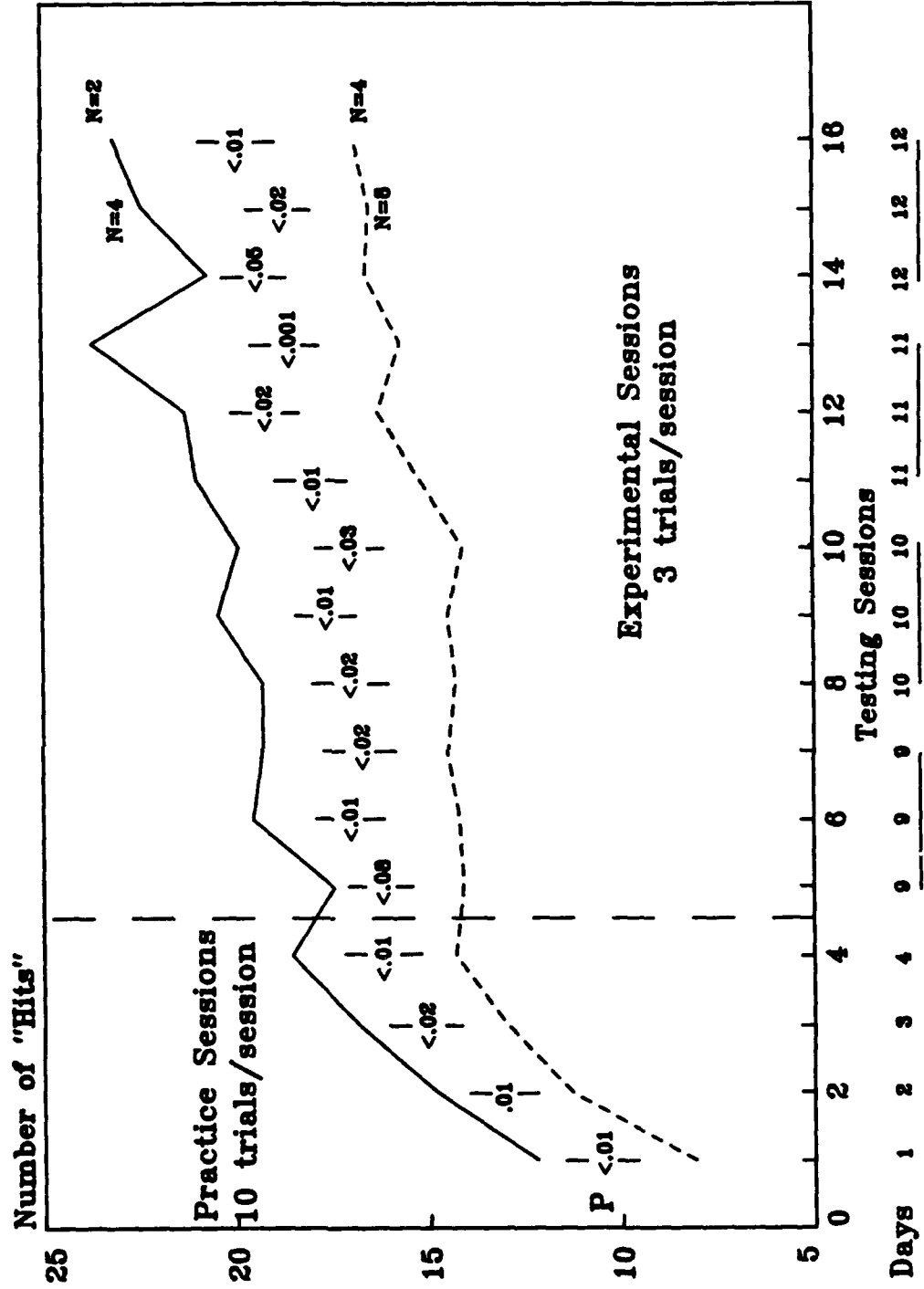
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# Oral Contraceptives and Performance

-Atari "Jet Fighter" Video Game-

Pill Users (N=9)  
Non-Users (N=6)



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